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PATENT SPECIFICATION



Application Date : Sept. 16, 1924. No. 21,825 / 24.

239,052

" " May 9, 1925. No. 12,067/25.

One Complete Left : June 16, 1925.

Complete Accepted : Sept. 3, 1925.

PROVISIONAL SPECIFICATION.

No. 21,825, A.D. 1924.

Improved Method or Process of Rolling Certain Metal Sections, and Machinery or Appliances for Use therein.

We, SAMUEL WEBB and HORACE CROMWELL GUEST, both of 130, Oakham Road, Dudley, in the County of Worcester, subjects of the King of Great Britain, do hereby declare the nature of this invention to be as follows:—

This invention has reference to the manufacture or production, by a method or process of rolling, of metal sections incorporating one or more dovetail grooves or channels, and is particularly applicable to the manufacture of multiple-grooved steel strips or "flats" such as are adapted to be fashioned into the rims or felloes of heavy rubber-tired vehicle wheels.

The usual method of producing such strips or flats with a plurality of dovetail-sectioned grooves disposed in parallel to one another throughout the length of the strip, is to first roll the latter in ordinary ribbed rolls to produce section in which the grooves are rectangular or have their sides perpendicular to their bottoms, and subsequently, by machine tools, to undercut the sides of the grooves for converting the latter to the desired dovetail section.

This known method involves several operations and is obviously expensive, but according to our invention, we propose to produce dovetail-sectioned grooves in a strip or flat wholly by rolling—thus entirely eliminating machining operations and considerably reducing the cost of production.

Our improved method or process involves two direct rolling operations. In first of these operations, a rectangular strip is passed through a single pair of parallel rolls which produce in the strip, a plurality of grooves having straight or

perpendicular sides and of a width throughout substantially corresponding to the width of the bottom or widest part of the ultimate dovetail section; the rolls used in this stage being so formed that, simultaneously with the production of the grooves described, they displace metal out of the body of the strip towards the opposite sides of each groove in such a way that, when the strip emerges from the rolls, there are parallel ribs or ridges of metal projecting a little above the top of the strip, and running along the opposite sides of each groove. Each of these ribs has a perpendicular side falling in the same plane as the corresponding side of the complementary groove, and an inclined or curved side merging into the top of the strip.

The second operation or stage of the process involves the inward displacement, by special rolls, of the before-mentioned ribs or ridges in such a way that, after the grooved strip produced in the first stage has been passed through these special rolls, it emerges in the form of a strip having dovetail-sectioned grooves and of uniform thickness between the grooves.

In this second stage, the displacement of the ridges bordering the grooves is effected by passing the strip produced in the first stage successively through two pairs of rolls, one pair of which inwardly displaces the ridge metal on (say) the left hand sides of all the grooves and the next pair similarly displaces the ridges on the other or right-hand sides of all the grooves: the conversion or transformation of the grooves from the perpendicular-sided section to the dovetail-section being thus effected in two stages by successive

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passes through two pairs of rolls, both of which may be mounted, one behind the other, in a common housing.

Each of the two pairs of rolls employed in giving the finished section to the grooves comprises a horizontal cylindrical roll and a skew-mounted conical roll. The horizontal roll has a formation corresponding to the finished shape to be given to the under or un-grooved side of the strip, whereas the conical roll comprises a plurality of annular ribs, corresponding to the number and lateral spacing of grooves in the strip to be produced, whilst the first or leading conical roll of the two pairs is formed with a like number of annular clearances, disposed close up to the complementary ribs on the sides remote from the larger end of the roll. The purpose of these clearances in the leading roll is to ensure that that roll shall operate for displacing the ridge-metal on one side only of each groove in the strip, leaving such metal intact for displacement in the second pair of rolls.

The peripheries of the ribs on both conical rolls are coned to the same taper as the body of the roll—which taper is determined by the angle of the sides of the dovetail-section to be imparted to the grooves—and each of the said taper rolls is mounted at such a working angle as to dispose the peripheries of its ribs, and of the parts (other than the clearances in the first conical roll) between the ribs, parallel to the periphery of the complementary horizontal roll.

The conical rolls are disposed at opposite angles: that is to say, where the leading roll is designed to displace the ridge-metal on the left hand sides of the grooves and the back roll is designed to similarly displace the metal on the right sides of the grooves, the first mentioned roll is set with its larger end to the left of the housing and the back roll is set with its larger end to the right.

Working with a system of rolls such as described in which the left hand sides of the grooves are converted to the dovetail section by the first pair of finishing rolls, the strip as produced in the first

stage or operation of the process is passed on between the leading pair of finishing rolls, the taper roll of which inwardly displaces or rolls over the ridge metal on the left of each groove against the left hand edge of the rib that is travelling or running in that groove, so that the rib-edge determines the dovetail angle of the corresponding side of said groove. Meanwhile, the annular clearance on the side of each groove remote the larger end of the roll runs idly over the rib-metal at the right of the groove and prevents any displacement or disturbance of that rib-metal.

On passing between the next or rear pair of finishing rolls, the ribs on the oppositely-pitched taper roll operate similarly to displace the upstanding ridges bordering the right sides of the grooves, and thus complete the conversion of all the grooves in the strip from a perpendicular-sided section to the desired dovetail section.

The two pairs of finishing rolls are preferably mounted respectively in separate compartments of a common housing and the bearings of the upper rolls are provided with independent adjusting screws or similar adjusting devices.

The methods and appliances herein described may also be applied to the production of grooved strips or flats in which the grooves are of a double dovetail section; i.e., of a section involving a wide dovetail superimposed on a narrower one. Such section may be rolled also in two stages, first by rolling the strip with superimposed and perpendicular-sided grooves of different widths, bordered respectively with up-standing ridges as already described, and subsequently displacing those ridges, first on one sides and then on the other sides of the grooves, by suitably-ribbed taper finishing rolls also as described.

Dated this 15th day of September, 1924.

ARTHUR SADLER & GOOLD,

Chartered Patent Agents,

44, Waterloo Street, Birmingham,
Agents for Applicants.

PROVISIONAL SPECIFICATION.

No. 12,067, A.D. 1925.

Improved Method or Process of Rolling Certain Metal Sections, and Machinery or Appliances for Use therein.

We, SAMUEL WEBB and HORACE GROMWELL GUEST, both of 130, Oakham Road, Dudley, in the County of Worcester, subjects of the King of Great

Britain, do hereby declare the nature of this invention to be as follows:—
This invention has reference to the manufacture or production, by a method—

or process of rolling, of metal sections incorporating one or more dovetail grooves or channels, and consists in further or alternative machinery or appliances for carrying out the second stage of the method or process of rolling described in the Provisional Specification of our Application for Letters Patent dated the 16th day of September 1924 No. 21,825.

The principal object of the present invention is to enable the said second or finishing stage of the process to be performed by a set or system of rolls in which all the rolls are horizontal or are run on spindles disposed horizontally in their holsters.

To realize this object, and thus considerably simplify the construction and operation of the machinery required for working the process, both the ribbed or upper roll that gives the finished section to the grooves in the strip and the complementary or under roll whose section corresponds to the finished shape of the under or un-grooved side of the said strip are coned or tapered in reverse directions and are so mounted in the mill holsters as to run on horizontal and parallel spindles; the formation and disposition of the said upper and under rolls being such that the eye or pass between them is inclined to an angle corresponding to the roll taper so that the strip in travelling through the mill is tilted or canted from the horizontal to a degree determined by the said roll taper, and the sides of the grooves in the strip produced by the first stage of the process are correspondingly inclined, whereas the ribs of the upper roll run and operate in perpendicular planes.

In one arrangement of rolls according to the present invention, we use a double-coned upper roll, or a roll comprising two inversely-coned halves merging into one another at their smaller ends at the middle of the roll; each half being formed with a system of ribs and grooves similar to those embodied in the skew-mounted roll described in our former specification. This roll is arranged to run horizontally, and in conjunction therewith, we use a lower and horizontally-mounted roll which is also

double coned, but in the inverse sense to the upper roll, with the larger ends of the cones merging at the middle thereof. The tapering of the halves of the lower roll correspond in angle to the tapering of the complementary halves of the upper roll.

These two rolls when mounted in their holster, provide between them two eyes or passes which are inclined in opposite directions from the horizontal, and the two superimposed halves of the roll on the right hand side of the mill are adapted to operate on the left-hand sides of the grooves in the strip for displacing or transferring the ridge-metal to produce the dovetail over-hang, whereas the other two or left-hand halves are adapted to perform the same operation on the right-hand sides of the strip-grooves; these two stages of the finishing process being performed successively by first passing the strip as prepared by the first stage from front to back between the halves of the rolls on one side of the mill, then reversing the run of the rolls, and passing the half-finished strip from back to front between the other halves of the rolls.

Instead of using a single pair of rolls whose halves are reverse-coned as described, we may use two pairs of reverse-coned and horizontally-mounted rolls, between which the strip is passed in succession; these rolls being so arranged that the upper or ribbed roll of the one pair will operate to give the finished dovetail section to the right-hand sides of the grooves in the strip at the one pass, whereas the upper or ribbed roll of the other pair will similarly operate on the left-hand sides of the said grooves at the other pass.

If desired, or for the sake of convenience in manipulating the work, the pairs of rolls with parallel axes or spindles may be so mounted in their housing as to dispose the eye or pass between them in a horizontal or substantially horizontal plane.

Dated this 8th day of May, 1925.

ARTHUR SADLER & GOOLD,
Chartered Patent Agents,
44, Waterloo Street, Birmingham,
Agents for the Applicants.

COMPLETE SPECIFICATION

Improved Method or Process of Rolling Certain Metal Sections, and Machinery or Appliances for Use therein.

We, SAMUEL WEBB and HORACE CROMWELL GUEST, both of 130, Oakham Road, Dudley, in the County of

Worcester, subjects of the King of Great Britain, do hereby declare the nature of this invention and in what manner the

same is to be performed, to be particularly described and ascertained in and by the following statement:—

5 This invention has reference to the manufacture or production, by a method or process of rolling, of metal sections incorporating one or more dovetail grooves or channels, and is particularly applicable to the manufacture of
10 multiple-grooved steel strips or "flats" such as are adapted to be fashioned into the rims or felloes of heavy rubber-tyred vehicle wheels.

According to our invention, we propose
15 to produce dovetail sectioned grooves in a strip or "flat" wholly by rolling by a method or process which involves two direct rolling operations. In first of these operations, a rectangular strip is
20 passed through a single pair of parallel rolls which produce in the strip, a plurality of grooves having straight or perpendicular sides and of a width throughout substantially corresponding
25 to the width of the bottom or widest part of the ultimate dovetail section; the rolls used in this stage being so formed that, simultaneously with the projection of the grooves described, they displace metal
30 out of the body of the strip towards the opposite sides of each groove in such a way that, when the strip emerges from the rolls, there are (as in the section shown in Figure 1 of the accompanying
35 drawings) parallel ribs or ridges *a* of metal projecting a little above the top of the strip, and running along the opposite sides of each groove *b*. Each of these ribs has a perpendicular side *a*¹
40 falling in the same plane as the corresponding side *b*¹ of the complementary groove, and an inclined or curved side *a*² merging into the top of the strip.

The second operation or stage of the process involves the inward displacement, by special rolls, of the before-mentioned
45 ribs or ridges *a*, *a*¹, *a*², in such a way that, after the grooved strip produced in the first stage has been passed through these special rolls, it emerges in the form
50 of the finished strip (Figure 3) which comprises a series of parallel dovetail-sectioned grooves *c* and is of uniform thickness between the grooves.

55 In this second stage, the displacement of the ridges bordering the grooves is effected by passing the strip produced in the first stage successively through two pairs of rolls, one pair of which inwardly
60 displaces the ridge metal *a*, *a*¹, *a*² on (say) the left hand sides of all the grooves (see Figure 2) and the other pair similarly displaces the ridges on the other or right-hand sides of all the grooves to
65 produce the finished section Figure 3;

the conversion or transformation of the grooves from the perpendicular-sided section to the dovetail-section being thus effected in two stages by successive passes through two pairs of rolls.

One system of rolls according to the present invention for so displacing the ridges is shown in Figure 4 of the drawings; the two pairs of rolls being mounted one behind the other in a
75 common housing.

Each of the two pairs of rolls comprises a horizontal cylindrical roll *d* (or *d*¹) and a skew-mounted conical roll *e* (or *e*¹). Each horizontal roll has a formation corresponding to the finished shape to be given to the under or un-grooved side of the strip, whereas the conical roll comprises a plurality of annular ribs *f* (or *f*¹), corresponding to the number and lateral
85 spacing of grooves in the strip to be produced, whilst the first or leading conical roll *d* of the two pairs is formed with a like number of annular clearances *g*, disposed close up to the complementary ribs
90 on the sides remote from the larger end of the roll. The purpose of these clearances in the leading roll is to ensure that that roll shall operate for displacing the ridge-metal on one side only of each
95 groove in the strip, leaving such metal on the other side intact for displacement in the second pair of rolls.

The peripheries of the ribs on both conical rolls are coned to the same taper as the body of the roll—which taper is determined by the angle of the sides of the dovetail-section to be imparted to the grooves—and each of the said taper rolls is mounted at such a working angle as to
100 dispose the peripheries of its ribs, and of the parts (other than the clearances *g* in the first conical roll) between the ribs, parallel to the periphery of the complementary horizontal roll.

The conical rolls are disposed at opposite angles: that is to say, where the leading roll *e* is designed to displace the ridge-metal on the left hand sides of the
105 grooves (as in Figure 4) and the back roll is designed to similarly displace the metal on the right sides of the grooves, the first-mentioned roll is set with its larger end to the left of the housing and the back roll is set with the larger end
120 to the right.

Working with a system of rolls such as described in which the left hand sides of the grooves are converted to the dovetail section by the first pair of finishing
125 rolls, the strip (Figure 1) as produced in the first stage or operation of the process is passed in between the leading pair of finishing rolls, the taper roll *e* of which inwardly displaces or rolls over the
130

ridge metal on the left of each groove against the left hand edge of the rib that is travelling or running in that groove, so that the rib-edge determines the dovetail angle of the corresponding side of said groove. Meanwhile, the annular clearance g on the side of each groove remote from the larger end of the roll runs idly over the rib-metal a at the right of the groove and prevents any displacement or disturbance of that rib-metal.

On passing between the next or rear pair of finishing rolls, the ribs on the oppositely-pitched taper roll operate similarly to displace the upstanding ridges bordering the right sides of the grooves, and thus complete the conversion of all the grooves in the strip from a perpendicular-sided section to the desired dovetail section.

The two pairs of finishing rolls are preferably mounted respectively in separate compartments of a common housing and the bearings of the upper rolls are provided with independent adjusting screws or similar adjusting devices.

The methods and appliances herein described may also be applied to the production of grooved strips or flats in which the grooves are of a double dovetail section; i.e., of a section involving a wide dovetail superimposed on a narrower one. Such section may be rolled also in two stages, first by rolling the strip with superimposed and perpendicular-sided grooves of different widths, bordered respectively with up-standing ridges as already described, and subsequently displacing those ridges, first on one sides and then on the other sides of the grooves, by suitably-ribbed taper finishing rolls also as described.

In an alternative system or arrangement of rolls, the second or finishing stage of the process may be performed by a set of rolls in which all the rolls are horizontal or are run on spindles disposed horizontally in their holsters.

To realize this object, both the ribbed or upper roll that gives the finished section to the grooves in the strip and the complementary or under roll whose section corresponds to the finished shape of the under or un-grooved side of the said strip are coned or tapered in reverse directions and are so mounted in the mill holsters as to run on horizontal and parallel spindles; the formation and disposition of the said upper and under rolls being such that the eye or pass between them is inclined to an angle corresponding to the roll taper so that the strip in travelling through the mill is tilted or canted from the horizontal to a degree

determined by the said roll taper, and the sides of the grooves in the strip produced by the first stage of the process are correspondingly inclined, whereas the ribs of the upper roll run and operate in perpendicular planes.

An arrangement of rolls for working on this alternative method is shown in Figure 5 of the drawings, and comprises a double-coned upper roll h or a roll comprising two inversely-coned halves h^1, h^2 merging into one another at their smaller ends at the middle of the roll; each half being formed with a system of ribs i and grooves i^1 similar to those embodied in the skew-mounted roll described with reference to Figure 4. This roll is arranged to run horizontally, and in conjunction therewith, we use a lower and horizontally-mounted roll j which also comprises two coned portions j^1, j^2 arranged in the inverse sense to the upper roll, with the larger ends of the cones merging at the middle thereof. The tapering of the halves of the lower roll correspond in angle to the tapering of the complementary halves of the upper roll.

These two rolls when mounted in their holster, provide between them two eyes or passes which are inclined in opposite directions from the horizontal, and the two superimposed halves of the roll on the right hand side of the mill are adapted to operate on the right-hand sides of the grooves in the strip for displacing or transferring the ridge-metal to produce the dovetail over-hang, whereas the two other or left-hand halves are adapted to perform the same operation on the left-hand sides of the strip-grooves; these two stages of the finishing process being performed successively by first passing the strip as prepared by the first stage from front to back between the halves of the rolls on one side of the mill, then reversing the run of the rolls, and passing the half-finished strip from back to front between the other halves of the rolls.

Instead of using a single pair of rolls whose halves are reverse-coned as described, we may use two pairs of reverse-coned and horizontally-mounted rolls, between which the strip is passed in succession; these rolls being so arranged that the upper or ribbed roll of the one pair will operate to give the finished dovetail section to the right-hand sides of the grooves in the strip at the one pass, whereas the upper or ribbed roll of the other pair will similarly operate on the left-hand sides of the said grooves at the other pass.

If desired, or for the sake of convenience in manipulating the work, the

pairs of rolls with parallel axes or spindles may be so mounted in their housing as to dispose the eye or pass between them in a horizontal or substantially horizontal plane.

5 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

10 1. Method of producing dovetail-grooved sections by two rolling operations, the first of which produces a section substantially as shown in Figure 1
15 of the drawings, whilst in the second stage, the metal at opposite sides of the perpendicular sided grooves in the said

section is successively operated upon or displaced by two passes between rolls; the dovetail formation being imparted 20 simultaneously to the right hand sides of all the grooves during the one pass and to the left hand sides of the said grooves during the other pass.

2. Systems of rolls for performing the 25 second stage of the process claimed in Claim 1, substantially as herein described with reference to the accompanying drawings.

Dated this 15th day of June, 1925. 30

ARTHUR SADLER & GOOLD,
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44, Waterloo Street, Birmingham,
Agents for the Applicants.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1925.

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Fig. 1.

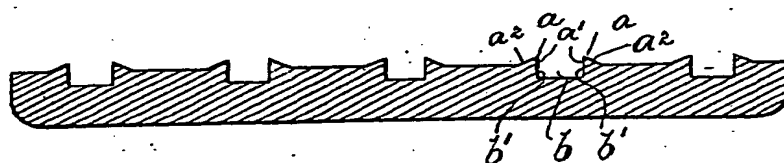


Fig. 2.

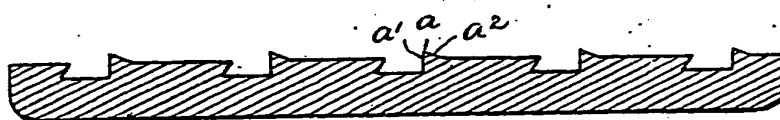


Fig. 3.

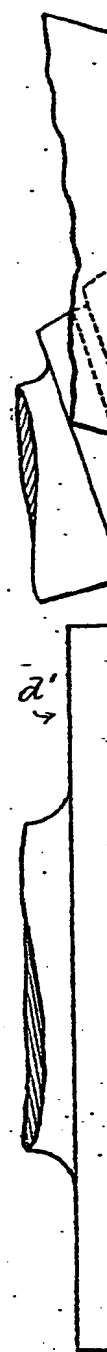
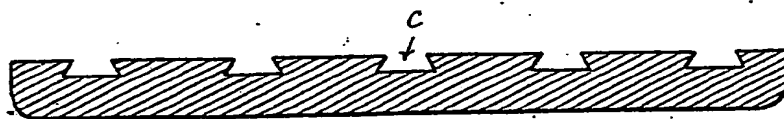


Fig. 4

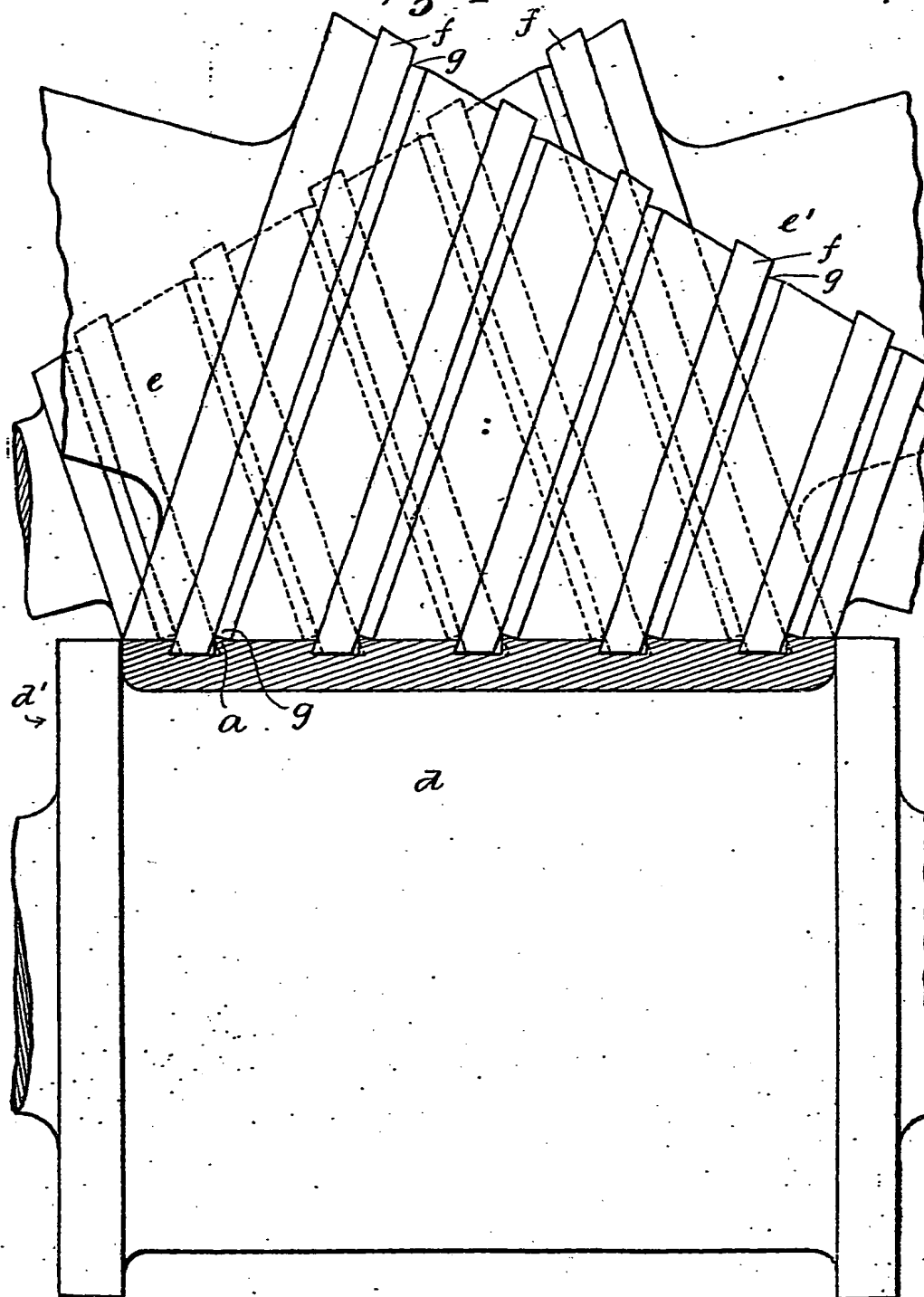


Fig. 1.

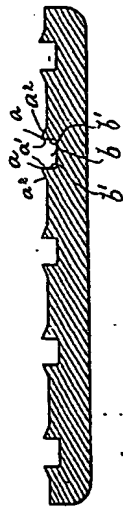


Fig. 2.



Fig. 3.



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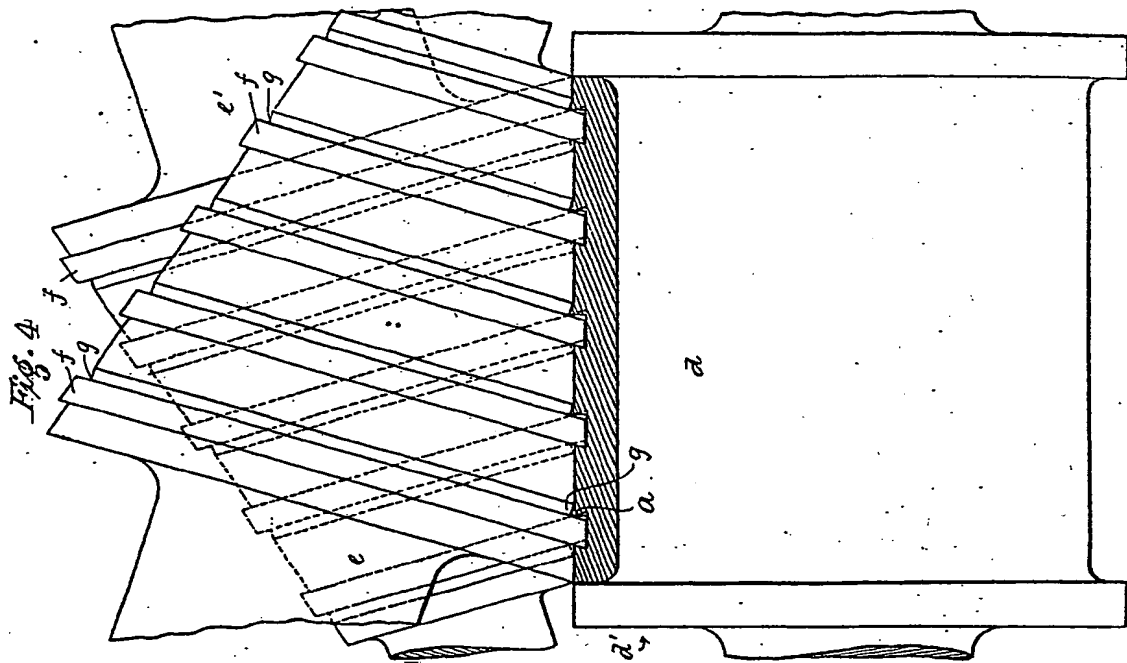
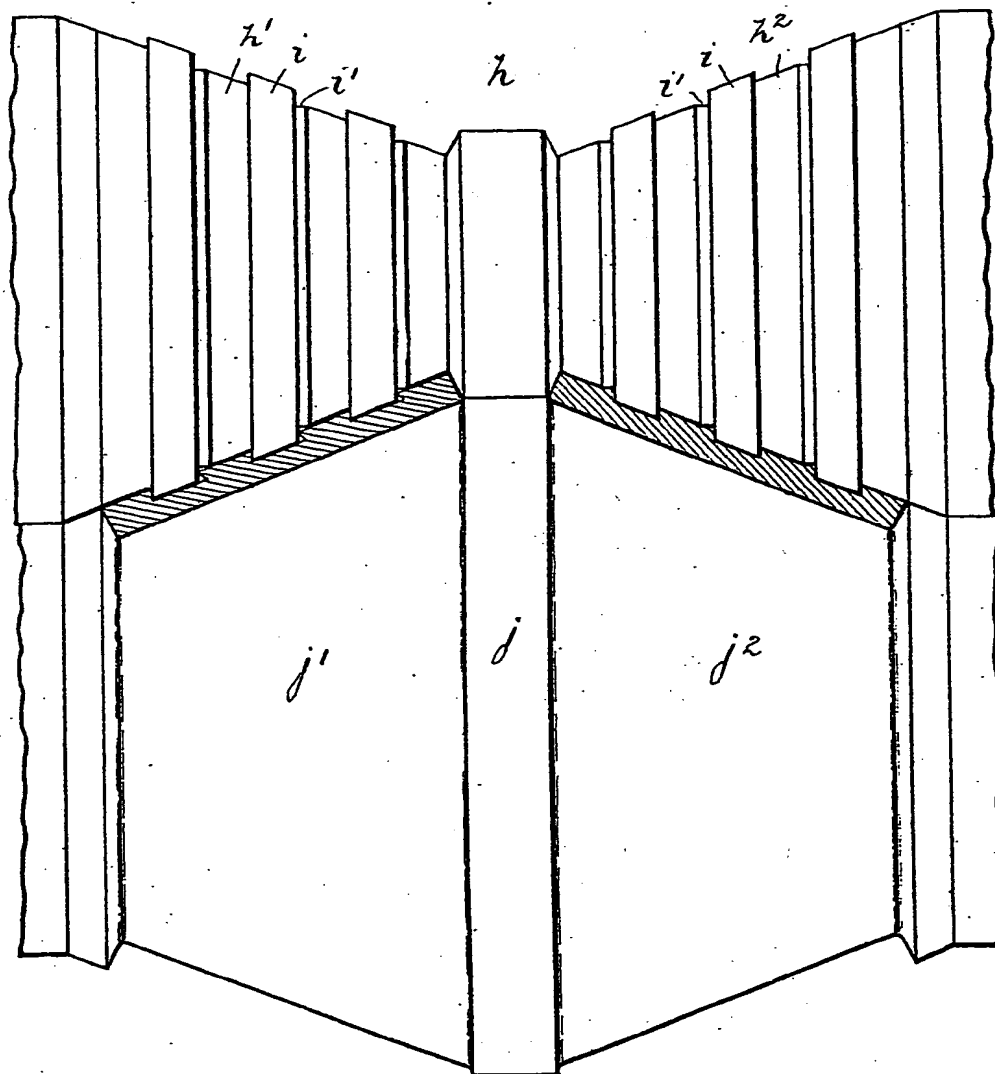


Fig. 5.

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